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Original Article

Measurement of anterior segment parameters in Saudi adults with myopia

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Abstract

Purpose: To measure anterior segment parameters of the eye in myopic Saudi population using Pentacam.
Method: This is retrospective cross-sectional study. Subjects were divided into three groups: low, moderate and high myopia groups. Anterior segment parameters including: central corneal thickness (CCT), thinnest corneal thickness (TCT), apex corneal thickness (Apex CT), corneal volume (CV), anterior chamber depth (ACD), anterior chamber volume (ACV) and corneal astigmatism (CA) were measured by Pentacam.
Results: A total of 504 eyes of 252 Saudi subjects with myopia were included in this study. The mean age ± standard deviation (SD) of subjects was 28.73 ± 6.18 years. The mean CCT, TCT, Apex CT, CV, ACD, ACV and CA for all myopic subjects were 557.21 ± 29.36, 554.09 ± 29.28, 556.10 ± 37.06, 61.30 ± 3.23 μm, 3.31 ± 0.27 mm, 211.15 ± 34.22 mm^3 and 0.89 ± 0.52 D, respectively. No significant differences ($P > 0.05$) were found between right and left eyes in all anterior segment parameters of all myopic eyes. However, a significant difference ($P < 0.05$) was found in ACD between low (3.27 ± 0.26 mm) and moderate (3.35 ± 0.30 mm) myopic groups. Within low myopia group, significant differences ($P < 0.05$) were found in ACD, ACV and CA between different genders. Anterior chamber depth and ACV values were lower in females while CA was lower in males. In addition, significant positive correlation was found between ACV and ACD in all myopic groups.
Conclusion: This study provided valuable measurements of the anterior segments parameters of the eye in myopic Saudi population. These parameters could be useful for ophthalmic practitioners in the clinic.

Keywords: Corneal thickness, Anterior chamber, Corneal astigmatism, Pentacam, Myopia

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Introduction

Measuring the parameters of the anterior segment of the eye is an essential test conducted in ophthalmic clinics. These parameters include: central corneal thickness (CCT), thinnest corneal thickness (TCT), apex corneal thickness (Apex CT), corneal volume (CV), anterior chamber depth (ACD), anterior chamber volume (ACV)[1] and corneal astigmatism (CA).[2] These measurements should be conducted precisely by ophthalmic practitioners for prescribing appropriate contact lenses[3] and/or calculating the power of intraocular lens (IOL) during IOL implant surgery.[4–7] For example, CCT, the distance between the anterior and posterior corneal surfaces,[1] is considered the main parameter that should be measured before refractive surgeries, especially laser assisted in situ keratomileusis.[8] In addition, TCT, which signifies the

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thinnest point of the cornea, should be measured when planning different types of corneal refractive surgeries using excimer lasers.[9] CV is a new ocular parameter used in ophthalmic clinics to detect keratoconus,[1] while ACD, which is the distance between the corneal surface and the lens anterior surface, is essential for calculating of IOL power.[8]

These parameters can be measured using different instruments such as Pentacam[1,10] and Orbscan.[11,12] Pentacam employs a new technique that is widely used to measure the parameters of the anterior segment of the eye. Many studies[1,5,8,10,12–16] have used Pentacam to measure the anterior segment parameters of the eye and have yielded accurate results.

Measurements of anterior segment parameters of the eye might differ among different ethnic populations. For example, the anterior segment parameters of the eye were found to differ between Indian,[1] Iranian,[5] and Chinese populations.[17] These differences among different populations could be due to genetic, environmental, or climatic factors, or differences in the instruments used for measurement.[18]

To our knowledge, no previous study has measured all the parameters of the anterior segment (corneal and anterior chamber parameters) among Saudi adults with different severities of myopia. Thus, the aim of this study was to measure the anterior segment parameters of the adult population with myopia in Saudi Arabia, by using Pentacam. The information about the mean anterior segment parameters of Saudi adults with myopia provided in this study will be useful to researchers and clinicians for assessing patients with corneal disease such as keratoconus and glaucoma, for screening patients scheduled to undergo refractive surgeries,[18] and for prescribing and accurately measuring the power of contact lenses and IOLs.[5,7]

Material and methods

This retrospective, cross-sectional study used data collected from patient medical records at AlHokama Eye Specialist Center in Riyadh. Both male and female Saudi patients with myopia who were aged between 18 and 39 years were included. The patients were divided into three groups according to the degree of myopia: low myopia group (<3.00 DS), moderate myopia group (3.00–6.00 DS), and high myopia group (>6.00 DS).[19] This study was approved by the Human Research Ethics Committee of the College of Applied Medical Science, King Saud University, Riyadh, Saudi Arabia (no. CAMS 132-36/37), and adhered to the tenets of the Declaration of Helsinki.

The study included patients with a best-corrected visual acuity (BCVA) of 20/20 or better. Patients with ocular disease, corneal disease (dystrophies), corneal ectasia (keratoconus), glaucoma, cataract, ocular trauma, or systemic diseases such as diabetes mellitus and rheumatoid arthritis were excluded from this study. Patients with a previous history of ocular surgery, contact lens use, or pregnancy were also excluded.

Ocular and visual examination results, including those for subjective refraction with BCVA, slit-lamp biomicroscopy, and Pentacam evaluation, were obtained from the patients' medical records. The anterior segment parameters of the eye, including CCT, TCT, apex CT, CV, ACD, ACV, and CA, measured using Pentacam were collected. Pentacam is a Scheimpflug imaging device comprising two cameras. The first camera is centrally located and is used to monitor fixation, while the second rotates 360 degrees to capture 12–50 images during a scan time of 2 s. It generates 138,000 true elevation points for each image.[20]

Statistical analysis

IBM SPSS Statistics for Windows, Version 22.0 (IBM Corp., Armonk, NY, USA) was used for statistical analyses was used for statistical analyses. As the data were normally distributed, *t*-test, ANOVA, and Pearson correlation tests were used to compare the measured parameters between groups. A dependent-samples *t*-test was used to investigate the difference in anterior segment parameters between the right and left eyes in all the groups (low, moderate, and high myopia groups). An independent-samples *t*-test was performed to evaluate the difference in anterior segment parameters between male and female patients, as well as to investigate the difference in anterior segment parameters among all myopia groups. Pearson correlation test was performed to determine the association between the parameters.

Results

Participants

In total, 252 patients with myopia were included in this study. Their mean age ± standard deviation (SD) was 28.73 ± 6.18 years (range, 18–39 years). The low myopia group included 125 patients (70 men; 55 women), the moderate myopia group included 98 patients (45 men; 53 women) and the high myopia group included 29 patients (7 men; 22 women).

No significant sex difference ($P > 0.05$) was observed in all the myopia groups (n = 122 men, 48%). In addition, no significant difference ($P > 0.05$) was observed between the right and left eyes for all the anterior segment parameters. Therefore, the right eyes of the patients were used for the comparisons between groups (i.e., the severity of myopia and patient sex).

No significant difference was observed in all the anterior segment parameters between all the myopia groups ($P > 0.05$) (Table 1).

Although ACD was higher in the moderate myopia group than in the low and high myopia groups (Table 1), the values were not statistically significant ($P > 0.05$).

A comparison of the anterior segment parameters between the eyes in the low and moderate myopia groups revealed a significant difference in ACD ($P = 0.03$). The value of ACD in the low myopia group (3.27 ± 0.26) was lower than that in the moderate myopia group (3.35 ± 0.30).

The effect of sex on the anterior segment parameters of the eyes was investigated in all the myopia groups. The low myopia group showed a significant difference in ACD ($P < 0.05$), ACV ($P = 0.00$), and CA ($P = 0.03$) between men and women. The ACD and ACV values were lower in women than in men, while CA was higher in women than in men (Table 2).

However, sex did not affect these parameters in the moderate and high myopia groups, because no significant sex differences ($P > 0.05$) were observed in these parameters. Nevertheless, a significant difference in CA ($P = 0.03$) was observed in the high myopia group (Table 2).

The association between ACV and ACD was investigated in all the myopia groups. The results showed a significant

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